REMARKS

Reconsideration of the subject application is respectfully requested.

Pending claims:

Claims 1-40 are pending in the subject application. The independent claims are claims 1, 10, 14, 19, 24, 28 and 32. Claims 32 through 40 are method claims. Claims 24-31 stand allowed, and claims 20-23, 33 and 38, have been objected to as being dependent upon a rejected base claim, but indicated to be allowable if rewritten in independent form including the limitations of the base claim and any intervening claims. Applicant gratefully acknowledges the Examiner's allowance and indication of patentable subject matter in those claims. Claims 1-19, 32, 34-37, 39 and 40 stand rejected .

As explained, for example, in paragraphs 0011, 0031 and 0036 of the published version of the subject application, configuring or fashioning the "distribution" of the magnetic flux density provided by the magnet sources of the field assembly of an actuator to take into account expected load and other characteristics can simplify the actuator design. In particular, it may be possible to substantially reduce or eliminate the need to apply or to control the current applied to the coil assembly of the actuator in order to obtain desired force versus stroke characteristics for the actuator. Paragraphs 0032 through 0035 provide an example where the sizing and distribution of adjacent magnets of the same polarity in the field assembly are selected so that a stroke versus force pattern for the actuator can be obtained which closely matches the load characteristics of a spring.

As recited in independent claims 1, 10, 14, and 32, the magnet sources of the field assembly are configured or arranged to provide distributions of flux density in the air gap related to the characteristics of a load. Independent claim 19 is directed to the use of consecutive or adjacent magnets of the same polarity, followed along the direction of motion by consecutive or adjacent magnets of a different polarity. These magnets will then provide a flux density distribution in the air gap which related to the sizing and distribution of the magnets along the direction of motion.

Claims 1, 5, 9-12 and 14-17 have been amended to more clearly recite the relationship between the characteristic of the load and the distributions of the flux density in the air gap over the stroke length of the claimed actuator. For example, amended claim 1 now recites that the load has a load characteristic over a stroke length, and that the flux density distributions in the air gap are selected to "substantially match" the load characteristic over the stroke length.

Amended claim 5 now recites that the load characteristic corresponds to a spring having a spring constant K, and that the flux density distributions over the stroke length vary "in correspondence to" the spring constant K over the stroke length. Amended claim 10 now recites that the load has a load characteristic over the stroke length and the flux density distribution in the air gap is provided over the stroke length "corresponding to the variation in the load characteristic over the stroke length." Support for these and the amendments to claims 9, 11-12 and 14-17 can be found, for example, in paragraphs 0011, 0031 and 0036 of the published version of the subject application.

Rejection under 35 USC 112, Second Paragraph:

The Examiner has rejected claims 1- 9, 11, 12, and 14-18 under 35 USC 112, second paragraph, as indefinite.

As to claims 1-9, the Examiner has asserted that "it is unclear what the function of the load characteristics represents . . . ." [*See* p. 3, Office Action.] As indicated above, independent claim 1 has been amended in order to clarify the relationship between the load characteristic over the stroke length and the selection of the flux density distributions in the air gap over the stroke length – namely to recite that they substantially match over the stroke length.

As to claims 14-18 the Examiner has asserted that "it is unclear how the flux distributions are linked to the undefined load characteristics . . . ." [*See* p. 3, Office Action.] Independent claim 14 has been amended to clarify that the provided flux density distributions in the air gap over the stroke length correspond to the load characteristic over the stroke length.

As to claims 5 and 17, the Examiner has taken the position that it is unclear "what claim 'the load characteristics correspond to a spring having a spring constant K' means "since every load can be represented as a spring having a spring constant K." [*See* p. 3, Office Action.] As described above, claim 5 has been amended to clarify that the load characteristic corresponds to a spring having a spring constant K, and that the provided flux density distributions over the stroke length vary "in correspondence to" the spring constant K over the stroke length. Claim 17 has been amended in a similar manner.

As to claims 9, 11, 12, 15 and 16, the Examiner has asserted that it is "unclear what the function of friction characteristics represents 'wherein the first plurality of magnets is further configured to provide a flux density distribution in the air gap as a function of friction characteristics of the actuator'." [*See* p. 3, Office Action.] Claim 9 has been amended to clarify that the actuator has a frictional component over the stroke length and that a flux density

distribution is provided in the air gap to substantially match the frictional component over the stroke length. Claims 11 and 15 have been amended to clarify that a frictional component is present over the stroke length, and that the flux density distribution provided in the air gap is to compensate the frictional component over the stroke length. Claims 12 and 16 have been amended to reflect the amendments to claims 11 and 15, respectively.

In view of the above clarifying amendments to claims it is respectfully submitted that the above passages are definite.

Rejection under 35 USC 102(b) -- Aoyama et al.:

The Examiner has rejected claims 1-12, 32, 34-37, 39 and 40 under 35 USC 102(b) as being anticipated by Aoyama et al., USP 5,808,381. Applicant respectfully traverses this rejection.

As understood by Applicant, Aoyama et al. disclose a linear motor in which a driving circuit, supplying sinusoidal current to the coils, changes the current supplied to each coil to provide "certain thrust forces." *See*, for example, col. 5, line 59 through col. 6, line 4; col. 2, lines 45-56; and col. 10, lines 35-37. Thus, Aoyama et al. is like the conventional linear actuators described in paragraph 0004 of the published subject application, in which desired force versus stroke characteristics are obtained by controlling the current being supplied to the coil or coils.

Moreover, there is no discussion in Aoyama et al. about configuring the magnets to provide flux density distributions that are selected to "substantially match" the load characteristics over the stroke length, such as recited in independent claim 1. Contrary to the Examiner's assertions, there is no discussion in Aoyama et al. of a correlation of the particular magnet configuration and flux density distribution to the characteristic of the particular load. Thus, Aoyama et al. do not disclose the use of distributed magnet field sources which provide a flux density distribution "corresponding to" the load characteristics over the stroke length, as in independent claim 10. Similarly, Aoyama does not teach or suggest the method of independent claim 32 of fashioning the magnet structure of the field assembly "in correspondence to the variations in the load characteristics over the stroke".

For these reasons, it is respectfully submitted that independent claims 1, 10 and 32 are allowable over Aoyama et al.. Further, it is respectfully submitted that claims 2-9 as dependent from allowable claim 1, claims 11-12 as dependent from allowable claim 10, and claims 34-37, 39 and 40, as dependent from allowable claim 32, are also allowable.

Rejection under 35 USC 102(e) – Ishiyama:

The Examiner has rejected claims 14-19 as being anticipated under 35 USC 102(e) by Ishiyama, USP 6,040,642. Applicant respectfully traverses this rejection.

As understood by Applicant, Ishiyama discloses a linear motor, which like Aoyama et al., uses an alternating current source to drive a number of coils in order to obtain desired force versus position characteristics. *See* Ishiyama, col. 2, lines 38-44, and Fig. 7. Further, as can be appreciated from examination of Fig. 8, the flux densities provided by the magnet structure in Ishiyama do not appear to correspond to the load characteristics of the load, for example a "printing head" as described at col. 1, lines 8-11 of Ishiyama. Instead, it is respectfully submitted that Ishiyama uses the combination of the flux densities of Fig. 8 and control of an alternating current source to drive a number of coils in order to provide the desired force versus position characteristic of the disclosed linear motor. In contrast, independent claim 14 is directed to a linear actuator operating upon a load having load characteristics over a stroke length, and in which distributed magnetic field sources provide "a flux density distribution in an air gap over the stroke length corresponding to the load characteristic over the stroke length." It is respectfully submitted that Ishiyama does not teach or suggest such a correspondence, first because Ishiyama is directed to a motor, not to an actuator, and second because there is no disclosure in Ishiyama of correlating the load characteristics to the flux density distribution provided by the magnet structures.

For the foregoing reasons, it is respectfully submitted that independent claim 14, and claims 15-18 as dependent from claim 14, are allowable over Ishiyama. Further as to claims 15 to 17, it is respectfully submitted that Ishiyama does not teach or suggest providing flux density distributions in the air gap to compensate for, or in correspondence to, frictional components or spring constants K, and for these additional reasons claims 15 to 17 are allowable over Ishiyama. Additionally as to claim 18, it is respectfully submitted that Ishiyama teaches a flux density distribution which alternates between positive and negative peaks along the direction of motion of the disclosed motor. As described at col. 3, lines 37-40 of Ishiyama, in the context of

Fig. 8, "the magnetic flux density has a peak at the connecting portion between two adjacent permanent magnets 13." Thus, Fig. 8 in Ishiyama does not show a flux density distribution in the air gap that decreases in a direction of motion, but instead shows one that alternates between increasing and decreasing amounts along the direction of motion.

As to claim 19, the Examiner points to Fig. 5 of Ishiyama as disclosing a first plurality of magnets of one polarity followed by a second plurality of magnets of a different polarity. It is respectfully submitted that Fig. 5, reproduced below, shows a sequence of magnets of alternating polarity – that is SN, NS, SN, NS, etc. Thus, there is no first plurality of magnets of one polarity, nor is there a second plurality of magnet of a different polarity.

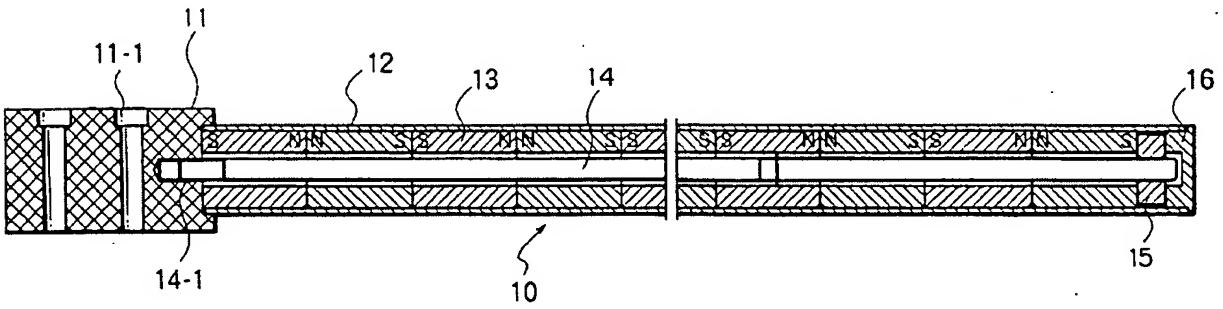


FIG. 5

For the foregoing reasons it is respectfully submitted that claims 14-19 are allowable over Ishiyama.

Rejection under 35 USC 103:

The Examiner has rejected claims 13 and 25 under 35 USC 103(a). As to claim 13 the Examiner relies upon Aoyama et al. USP 5,808,381 in view of Ishiyama USP 6,040,642. For claim 25, the Examiner relies upon Ishiyama in view of Denne [US 2002/0190582]. Applicant respectfully traverses these rejections.

It is respectfully submitted that claim 13 is allowable as being dependent from allowable base claim 10. Further, as pointed out above in connection with the rejection of claim 18 as anticipated by Ishiyama, Ishiyama teaches a flux density distribution that alternates between

increasing and decreasing amounts along the direction of motion, and not a distribution which increases in a direction of motion.

With respect to claim 25, it is respectfully submitted that claim 25 is allowable as dependent from allowed base claim 24.

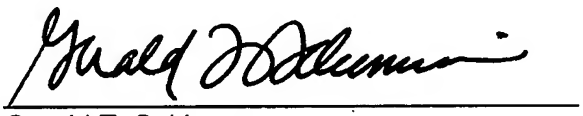
Conclusion:

For at least the foregoing reasons it is respectfully submitted that the subject application is in condition for allowance, and the Examiner's indication to that end is respectfully solicited.

The Commissioner is hereby authorized to charge any fees that may be associated with this communication to Deposit Account No. 07-1896.

Respectfully submitted,

DLA PIPER US LLP

Date: September 28, 2006 By: 

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